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| 09/988,788 | 11/20/2001 | Teruhiro Shiono | 2001_1700A | 9136 |

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EXAMINER

AGUSTIN, PETER VINCENT

ART UNIT PAPER NUMBER

2652

DATE MAILED: 04/07/2004

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/988,788

Applicant(s)

SHIONO ET AL.

Examiner

Peter Vincent Agustin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 November 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. ____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

2. Figure 8 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: element 17 on page 13, lines 2, 6, etc. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

4. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors, e.g.,

Page 18, line 12: "a allowable" should be --an allowable--.

Claim 4, line 6 & claim 19, line 6: "pin holes" should be --pinholes--.

Claims 6, line 5 & claim 21, line 5: "plural" should be --plurality of--.

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

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5. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 2 & 11 rejected under 35 U.S.C. 102(e) as being anticipated by Wierenga (US 6,552,985).

In regard to claim 1, Wierenga discloses an optical information recording and reproducing apparatus (figure 4) for recording information bits into an information recording medium (1) having a recording member (figure 1, elements 41-43) into which information bits are recorded in a three-dimensional arrangement by changing an optical constant (column 4, lines 39 & 55, i.e., “transmission coefficient” or “transmission properties”) of the recording member of the recording medium, the apparatus comprising: a light source (figure 1, element 3) that emits a light beam (2); an objective lens (inherent: see note below) that converges the light beam emitted from the light source to an information recording medium; and a light detector (inherent: see note below) that detects the light beam from the information recording medium, wherein a thickness of the recording member is larger than a wavelength of the light beam (column 4, lines 9-24), and the information bits are sequentially recorded into the recording member in a three-dimensional arrangement such that a converging light beam from the

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objective lens does not pass through information bits that have already been recorded (column 3, lines 13-32). It should be noted that the claimed objective lens and light detector are inherent since focused light and detected light are disclosed (see column 4, line 11 & figure 4, element 55).

In regard to claim 2, Wierenga discloses that the information bits are sequentially recorded from the farthest points from the objective lens in the recording member (see column 3, lines 13-32).

In regard to claim 11, Wierenga discloses that the information recording medium comprises only a single recording member (figure 1, element 42).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 9 & 10 rejected under 35 U.S.C. 103(a) as being unpatentable over Wierenga as applied to claim 1 above, and further in view of Ito et al. (hereafter Ito) (US 5,734,632).

For a description of Wierenga, see the rejection above. Wierenga, however, does not disclose that the optical constant is a refractive index, and that the amount of the change in refractive index is more than or equal to 0.005.

Ito discloses recording/reproducing information by changing the refractive index, wherein the amount of change is 0.005 or more (column 9, lines 6-22). At the time the invention was made, it was well-known to use either transmission or refractive change for their purpose in

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recording information and selection of either one would have been obvious to one of ordinary skill in the art. One of ordinary skill in the art, furthermore, would have recognized that use of ^{in Wierenga} Λ either the change in transmission coefficient taught by Wierenga or the change in refractive index taught by Ito would have been obvious equivalent alternative types of recording techniques, because both teachings perform the same function of recording information to a recording medium.

10. Claim 17 & 24 rejected under 35 U.S.C. 103(a) as being unpatentable over Wierenga in view of Ito.

Wierenga discloses an optical information recording and reproducing apparatus (figure 4) for recording information bits into an information recording medium (1) having a recording member (figure 1, elements 41-43) into which information bits are recorded in a three-dimensional arrangement, the apparatus comprising: a light source (3) that emits a light beam (2); an objective lens (inherent: see claim 1 rejection above) that converges the light beam emitted from the light source to an information recording medium; and a light detector (inherent: see claim 1 rejection above) that detects a light beam from the information recording medium, wherein a thickness of the recording member is larger than a wavelength of the light beam (column 4, lines 9-24), wherein the information bits are recorded sequentially into the recording member in a three-dimensional arrangement such that the number of rows of information bits which have been already recorded in the direction of optical axis is not more than 4 (column 3, lines 13-32 and figure 1). Furthermore, in regard to claim 24, Wierenga discloses that the information recording medium comprises only a single recording member (figure 1, element 42). However, Wierenga does not disclose that information bits are recorded by changing a refractive

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index of the recording member of the recording medium wherein amount of the change in refractive index is less than or equal to 0.02.

Ito discloses recording/reproducing information by changing the refractive index, wherein the amount of change is less than or equal to 0.02 (column 9, lines 6-22). At the time the invention was made, it was well-known to use either transmission or refractive change for their purpose in recording information and selection of either one would have been obvious to one of ordinary skill in the art. One of ordinary skill in the art, furthermore, would have recognized that ^{in Wierenga} use of either the change in transmission coefficient taught by Wierenga or the change in refractive index taught by Ito would have been obvious equivalent alternative types of recording techniques because both teachings perform the same function of recording information to a recording medium.

11. Claims 3 & 18 rejected under 35 U.S.C. 103(a) as being unpatentable over Wierenga as applied to claim 1 above and over Wierenga & Ito as applied to claim 17 above, and further in view of Kasono (US 6,292,442).

For a description of Wierenga & Ito, see the rejections above. However, it is not disclosed that the objective lens comprises a lens of which numerical aperture is more than or equal to 0.7, and pinholes are disposed in an optical path including the objective lens and the light detector, thereby the light beam from the information recording medium is detected by the light detector after passing through the pinholes.

Kasono discloses pinholes (figure 5, element 213) disposed in an optical path including an objective lens (205) and a light detector (211), thereby the light beam from an information recording medium (1) is detected by the light detector after passing through the pinholes, the

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pinholes being provided so that light can be gathered accurately and to remove aberration, as known in the art (see also Takahashi (US 6,072,763) (title)). Furthermore, Kasono discloses that an object lens with a large numerical aperture is used (column 1, lines 7-9), i.e., one that would be greater than 0.7, in order to increase recording density. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to use an object lens having a large numerical aperture, i.e., 0.7 or more, in the primary references as taught by Kasono, in order to provide increased recording density. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have added the pinholes of Kasono along the optical path of the objective lens and the light detector of Wierenga & Ito, the motivation being to accurately gather light and remove aberration, thereby enabling recording accuracy.

12. Claims 4, 5, 6, 16, 19, 20, 21 & 29 rejected under 35 U.S.C. 103(a) as being unpatentable over Wierenga as applied to claim 1 above and over Wierenga & Ito as applied to claim 17 above, and further in view of Hino et al. (hereafter Hino) (US 6,178,151).

For a description of Wierenga & Ito, see the rejections above. However, in regard to claims 4 & 19, neither Wierenga nor Ito discloses a focus/track error signal detecting optical element which is an optical splitting element and disposed in an optical path including the objective lens and the light detector, and a pinhole array having a plurality of pin holes and disposed in the optical path, wherein the light beam from the information recording medium is split into a plurality of light beams by means of the focus/track error signal detecting optical element, and the plurality of light beams are detected by the light detector after passing through corresponding pinholes of the pinhole array.

Hino discloses a focus/track error signal detecting optical element (figure 1, element 106) which is an optical splitting element and disposed in an optical path including an objective lens (105) and a light detector (109), and a pinhole array (108) having a plurality of pin holes and disposed in the optical path, wherein a light beam from an information recording medium (112) is split into a plurality of light beams by means of the focus/track error signal detecting optical element, and the plurality of light beams are detected by the light detector after passing through corresponding pinholes of the pinhole array. It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have added the focus/track error signal detecting optical element of Hino to the apparatus of Wierenga & Ito, the motivation being to compensate for offsets caused by focusing/tracking errors, thereby maintaining recording accuracy; and to have added the pinhole array of Hino to the apparatus of Wierenga & Ito, the motivation being to accurately gather light and remove aberration, thereby enabling recording accuracy. (See also claims 3 & 18 rejections above).

In regard to claims 5 & 20, neither Wierenga nor Ito discloses a focus/track error signal detecting optical element disposed in an optical path including the objective lens and the light detector, wherein the light beam from the information recording medium is split into a plurality of light beams by means of the focus/track error signal detecting optical element, and each split light beam is detected by the light detector having an area smaller than that of the split light beam.

Hino discloses a focus/track error signal detecting optical element (figure 1, element 106) disposed in an optical path including an objective lens (105) and a light detector (109), wherein a light beam from an information recording medium (112) is split into a plurality of light beams by

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means of the focus/track error signal detecting optical element, and each split light beam is detected by the light detector having an area smaller than that of the split light beam (note how the beam from element 106 converges into a smaller area of element 109). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have added the focus/track error signal detecting optical element of Hino to the apparatus of Wierenga & Ito, the motivation being to compensate for offsets caused by focusing/tracking errors, thereby maintaining recording accuracy.

In regard to claims 6 & 21, neither Wierenga nor Ito discloses a focus/track error signal detecting optical element disposed in an optical path including the objective lens and the light detector, and a pinhole array having a plurality of pinholes and disposed on the optical path, wherein the light beam from the information recording medium is split into a plurality of light beams by means of the focus/track error signal detecting optical element, and the light beams corresponding to track error signals are detected by the light detector after passing through pinholes of the pinhole array.

Hino discloses a focus/track error signal detecting optical element (figure 1, element 106) disposed in an optical path including an objective lens (105) and a light detector (109), and a pinhole array (108) having a plurality of pinholes and disposed on the optical path, wherein a light beam from an information recording medium (112) is split into a plurality of light beams by means of the focus/track error signal detecting optical element, and the light beams corresponding to track error signals are detected by the light detector after passing through pinholes of the pinhole array. It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have added the focus/track error signal detecting optical

element of Hino to the apparatus of Wierenga & Ito, the motivation being to compensate for offsets caused by focusing/tracking errors, thereby maintaining recording accuracy; and to have added the pinhole array of Hino to the apparatus of Wierenga & Ito, the motivation being to accurately gather light and remove aberration, thereby enabling recording accuracy. (See also claims 3 & 18 rejections above).

In regard to claims 16 & 29, it is not disclosed that a focus position of the objective lens is controlled with reference to an interface of the recording member of the recording medium.

Hino discloses in column 7, lines 38-42 that a focus position of the objective lens is controlled with reference to an interface of the recording member of the recording medium. It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have controlled a focus position as suggested by Hino with reference to an interface of the recording member of Wierenga & Ito, the motivation being to maintain optimum recording accuracy.

13. Claims 7 & 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Wierenga as applied to claim 1 above and over Wierenga & Ito as applied to claim 17 above, and further in view of Suh (US 4,793,696).

For a description of Wierenga & Ito, see the rejections above. Furthermore, Wierenga discloses in column 4, lines 9-19 that the wavelength λ of the light beam emitted from the light source is in a range satisfying $0.35 \mu\text{m} \leq \lambda \leq 0.45 \mu\text{m}$. It should be noted that a wavelength of $0.35 \mu\text{m}$ (or 350 nm) is in the ultraviolet range and a wavelength of $0.45 \mu\text{m}$ (or 450 nm) is in the visible part of the light spectrum, as known in the art. However, it is not disclosed that the optical system including the objective lens is configured to be achromatic.

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Suh discloses an optical system configured to be achromatic so that the optical system is able to use different lasers, i.e., lasers of different wavelengths (column 5, lines 16-25). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have configured the optical system of Wierenga & Ito to be achromatic, as suggested by Suh, the motivation being to enable the optical system to use lasers of different wavelengths, thereby making the system compatible with a wider range of optical devices.

14. Claims 8 & 23 rejected under 35 U.S.C. 103(a) as being unpatentable over Wierenga as applied to claim 1 above and over Wierenga & Ito as applied to claim 17 above, and further in view of McLeod et al. (hereafter McLeod) (US 6,020,985).

For a description of Wierenga & Ito, see the rejections above. However, neither Wierenga nor Ito disclose a spherical aberration correcting element disposed in an optical path including the light source and the objective lens, wherein the spherical aberration correcting element controls an amount of spherical aberration in accordance with a recording depth of the information bits to be recorded into the recording member.

McLeod discloses in figure 1B a spherical aberration correcting element (39a) disposed in an optical path including a light source (34) and an objective lens (48a), wherein the spherical aberration correcting element controls an amount of spherical aberration in accordance with a recording depth of information bits (see column 5, lines 43-60) to be recorded into a recording member (figure 2B, element 66). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have added the spherical aberration correcting element of McLeod to the apparatus of Wierenga & Ito, the motivation being to compensate for spherical aberration, thereby minimizing recording/reading errors.

15. Claims 12, 13, 25 & 26 rejected under 35 U.S.C. 103(a) as being unpatentable over Wierenga as applied to claim 1 above and over Wierenga & Ito as applied to claim 17 above, and further in view of Kikukawa et al. (hereafter Kikukawa) (US 6,169,722).

For a description of Wierenga & Ito, see the rejections above. However, in regard to claims 12 & 25, Wierenga & Ito remain silent to whether the information recording medium comprises a recording member and a substrate. In regard to claims 13 & 26, Wierenga & Ito remain silent to whether the information recording medium is configured by a recording member sandwiched between a substrate and a protecting member.

In regard to claims 12 & 25, Kikukawa discloses in figures 5 & 6 a recording medium comprising a recording member (4) and a substrate (2). In regard to claims 13 & 26, Kikukawa discloses in figures 5 & 6 a recording medium configured by a recording member (4) sandwiched between a substrate (2) and a protecting member (6). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have added the substrate and protecting member of Kikukawa to the information recording medium of Wierenga, in order to make the disc and keep it undamaged.

16. Claims 14 & 27 rejected under 35 U.S.C. 103(a) as being unpatentable over Wierenga as applied to claim 1 above and over Wierenga & Ito as applied to claim 17 above, and further in view of Durham (US 5,532,998).

For a description of Wierenga & Ito, see the rejections above. However, it is not disclosed that the light detector comprises an avalanche photodiode.

Durham discloses a light detector comprising an avalanche photodiode that provides greater sensitivity (column 14, lines 9-12). It would have been obvious to one of ordinary skill in

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the art at the time of invention by the applicant to have provided an avalanche photodiode to the light detector of Wierenga & Ito as suggested by Durham, the motivation being to provide greater sensitivity.

17. Claims 15 & 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Wierenga as applied to claim 1 above and over Wierenga & Ito as applied to claim 17 above, and further in view of Ishii et al. (hereafter Ishii) (US 4,125,860).

For a description of Wierenga & Ito, see the rejections above. However, neither Wierenga nor Ito disclose a condenser lens disposed on one side of the information recording medium opposite to the objective lens, the condenser lens converging the light beam from the information recording medium to the light detector to detect the light beam.

Ishii discloses in figure 5 a condenser lens (33) disposed on one side of an information recording medium (20) opposite to an objective lens (32), the condenser lens converging a light beam from the information recording medium to a light detector (34 & 35) to detect the light beam. It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have added the condenser lens of Ishii to the apparatus of Wierenga & Ito, the motivation being to reduce the size and cost of the apparatus while maintaining reproduction with high efficiency.

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Nishiuchi et al. (US 5,097,464) discloses in figures 6a-6c recording on different layers of a multilayer disk.

Refregier et al. (US 5,258,969) discloses recording and reading from a multilayer optical disk, where the signal to noise ratio is worst at the farthest layer.


Rosen et al. (US 5,487,060) discloses multiple surface data storage including an aberration compensator for screening out unwanted light.

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter Vincent Agustin whose telephone number is (703) 305-8980. The examiner can normally be reached on Monday thru Friday 9:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen can be reached on (703) 305-9687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PVA
03/24/2004


W. R. YOUNG
PRIMARY EXAMINER